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ABSTRACT

A three-phase inservice program was developed for New Jersey high school science teachers. During the first phase, teachers received pre-inservice training (obtaining computer hardware and software, becoming familiar with their use, beginning to use an electronic information exchange system-EIES and giving information to college facilitators as the desired content for summer training). Summer inservice training took place during the second phase. The third phase examined the teachers' continued inservice and usage of electronic communication, and their ability to apply material to classroom situations. Data were collected by means of evaluation forms, follow-up questionnaires, and on-line monitoring of participant time on the EIES, number of messages, and content of the conferencing to answer four questions. These questions focused on the role the EIES played in the effectiveness of the project, effect of inservice sessions and the EIES on classroom practices, effect of project activities on participants (other than classroom applications), and on whether teachers would use the EIES to follow-up on the inservicing and to discuss curricular and instructional issues on support of the training. Preliminary findings (which indicate the project's effectiveness) and three observations regarding the implementation process are presented. (JN)

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Improving Secondary Science Instruction Through Inservice Training and An Electronic Information Exchange System (EIES)

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Paper Presented at the Annual Conference
of the American Educators Research Association,
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Improving Secondary Science Instruction Through
Inservice Training and An Electronic
Information Exchange System (EIES)

I. PROJECT DESCRIPTION

Objectives

The objectives of the research have been:

1. To identify if secondary science teachers will use an electronic communications system to discuss instructional and curriculum issues.

2. To identify how secondary science teachers used the electronic communications system.

3. To measure the effect of an electronic communications system on teacher inservicing.

4. To measure the effect of inservicing and an electronic communications system on classroom instruction.

Theoretical Framework

The most often cited barrier to the improvement of instruction is the lack of adequate teacher inservicing programs. Inservicing is defined as: "a series of instructional programs made available to a specific group of professional staff members for the purposes of promoting participant growth and increasing job competence," (Rogus, 1983).

Teacher inservicing is often inadequate due to institutional and behavioral factors, e.g., a lack of teacher input into the needs identification and the planning for the training; unclear expectations and outcomes; a lack of administration commitment and support (time, financial, materials); and a lack of follow-up for implementation through continued access to the "expert" trainers, on-going seminars, and support groups. (Fullan, 1982; Berman & McLaughlin, 1977; Sarason, 1971).

The inservicing commonly found in school districts is one-half school day per month or one hour per month after school in lieu of a staff conference. Guest speakers are often invited to lecture the teachers on a variety of disparate topics. The budget for inservicing teachers is typically no more than one one-hundredth of the total school district budget, as compared to successful businesses in the United States that are likely to spend ten percent of their annual gross revenues on staff development. (Harris, 1980; Moore and Hyde, 1978).

One area of instruction often cited as needing improvement has been science. Secondary science instruction was reported by national reports including, "Educating Americans for the 21st Century: Improving Math, Science and Technology Education," 1983, National Science Foundation, as well as statewide studies, "Report of the Governor's Commission on Science and Technology," 1983, State of New Jersey, and the "Report of the Advisory Council on Math/Science Teacher Supply and Demand," 1983,

State of New Jersey, as inadequate due to the knowledge explosion, emerging technology, and the poor performance by students in science as indicated by the National Assessment of Educational Progress (NAEP).

Considering the environment of an aging faculty, the reported increasingly inadequately prepared teachers from the teaching institutions, the knowledge and technological explosion, declining student performance and the trend toward more rigor and excellence, improving instruction through inservicing is one of the few and immediate solutions. Although this solution has been offered in every one of the recent national reports and a number of the state studies done in New Jersey, our experience is one that quality inservicing leading to instructional improvement is more easily written about than achieved.

To overcome the barriers to the improvement of instruction and the problems of teacher inservicing a model was developed by the New Jersey Departments of Education and Higher Education to effectively inservice and improve the classroom instruction of secondary science teachers. The model's framework for improving secondary science through teacher inservicing has the following characteristics:

1. A contract with sixteen school districts in the northern region of the state to participate in the year-long inservicing including a board resolution for participation, some costs to be paid for by the school district, participation by a minimum of two teachers who would volunteer, and released time during the school day for inservicing and electronic conferencing.

2. Agreement by the teachers to identify inservicing needs, and the process and content of the inservicing; participation in a two-week summer inservicing institute and follow-up seminars one per month during the school year; and, continued participation in the electronic conferencing. Teachers also agreed to use the programs and methodologies from the inservicing in the classroom. They also participated in the ongoing evaluation processes.

3. A contract with four state colleges to assess the teachers' inservicing needs, design the inservicing and develop the syllabus, conduct the training and facilitate the electronic conferences. A contract with the New Jersey Institute of Technology for the use of their electronic information exchange system (EIES) including conferencing, mail, and storage and retrieval.

4. The planning, coordination, and financial support of the Departments of Higher Education and Education including the purchase of all the necessary hardware and software for electronic communications, the payment of teacher inservicing stipends, and contracting costs for the higher education institutions.

The model has also incorporated those characteristics frequently reported as necessary for effective inservicing:

- Input from teachers into needs identification, inservicing content and processes.

- Mutually identified expectations and outcomes.
- Flexibility and diversity of the inservicing through the use of a consortium of higher education institutions.
- Planned sequential inservicing activities.
- Emphasis on growth through teacher self-selection and needs identification.
- Support and commitment of school district and state leadership.
- On-going seminars and access to the expert trainers, and group support through face-to-face inservicing and electronic conferencing.

Evaluation Model

For the purpose of evaluation, the project was divided into three phases: pre-inservice training, summer inservice training, and post-inservicing training (both short and long term). During the first phase, teachers were to receive their computer hardware and software, become familiar with their use, begin to message among themselves on the EIES system, and give information to the college facilitators as to desired content for the summer training. Phase two included the period of time where summer inservice was actually taking place while phase three examined the high school teachers continued inservice and usage of electronic communication, as well as their ability to apply material covered during the summer and follow-up inservicing during the school year in their classrooms.

Four major evaluation questions were examined in this project:

1. Would the participants use the electronic communications system to follow-up on the inservicing and to discuss curriculum and instructional issues in support of the training?

2. What role did the electronic communications system play in the effectiveness of the project?

3. What is the effect of the pre-service, summer and follow-up inservice sessions on the participants (other than classroom applications)?

4. What effect did the inservice sessions and the EIES network have on specific classroom practices?

Implementation process considerations included the role of the college faculty as facilitators in the project, and the identification of background differences among the high school teachers that might explain differential success rates, e.g., prior experience with micro-computers.

The evaluation data were collected through a workshop evaluation form, a follow-up questionnaire, and the on-line monitoring of participant time on the system, number of messages and the content of the conferencing.

II. EVALUATION DATA

At the time of this writing, the first two phases of the project have been completed, pre-inservice and summer inservice; throughout the fall, the post - inservicing has continued at each of the college sites. The data presented here were collected directly following the final summer inservice session and then six months later. Analyses are presented for each of these periods. Comparisons are also made between these two phases of the project.

Summer Workshop Inservicing

All participants attending the summer inservice workshops were asked to anonymously fill out a likert type project evaluation form. (See Table 2.) The high school teachers also responded to a set of open ended questions concerning their satisfaction with the project in general and with EIES in particular. Of the 29 active participants, responses were received from 25 (86%). Results are broken down into four main categories:

A. Demographic breakdown
B. Overall responses to evaluation form questions
C. College by college breakdown of results
D. Participant comments concerning use of EIES.

Some preliminary comments seem in order. On the whole, largely favorable responses were received in all categories. Therefore, little variation was present to allow any in-depth kinds of analyses. Certain arguable assumptions permitted some distinctions to be made among respondees and questions. These include making distinctions between "Agree" and "Strongly Agree" responses (rather than grouping them both into an "Agree" category) in order to identify differential response patterns.

A. Demographic Breakdown

Table 1 contains information on the summer workshop participants related to their group membership, subject they teach, and years of teaching experience. The information is presented in crosstabulated form across the three variables. The Group by Subject comparison (1a) indicates both highly heterogeneous groupings and more homogeneous ones. Additional comments made on some of the evaluation forms indicated a preference for homogeneous groupings However, these comments did not come primarily from Group I. Therefore, grouping by Subject Taught, while probably a preferable practice, is not necessarily essential.

Tables 1b and 1c give breakdowns on Group and Subject Taught by years of experience. While some differences exist among the colleges, the results do not approach statistical significance. (The low overall number of participants limits these analyses.) A similar pattern exists in 1c, physics teachers in the project tend to be less highly experienced than those in other areas. Not surprisingly, those who call themselves "supervisors" tend to be more experienced teachers. Again, the small sample size limits the interpretability of these patterns of results.

Table 1

Demographic Summary of Summer Workshop Participants

a.

Position	Physics Teacher	Chemistry Teacher	Supervisor/ Teacher	ROW Total
College				
I	5	4	0	9
II	0	4	3	7
III	0	4	1	5
IV	2	1	0	3
Column Total	7	13	4	

b.

Experience	7+ Years	14+ Years	21+ Years	28+ Years	ROW
College					
I	5	3	1	0	9
II	2	3	1	2	8
III	0	1	3	1	5
IV	3	0	0	0	3
Column total	10	7	5	3	

c.

Experience	7+ Years	14+ Years	21+ Years	28+ Years	ROW
Position					
Physics Teacher	5	2	0	0	7
Chemistry Teacher	4	3	5	1	13
Supervisor/Teacher	1	1	0	2	4
Column Total	10	6	5	3	

B. Response to Evaluation Form Questions

Responses were received from 25 participants in the summer programs. Their percentages of responses to the ten Likert scale questions are presented in Table 2. As mentioned above, the responses to these questions were largely favorable. These kinds of measures tend, however, to inflate participant approval ratings. We will therefore not limit our examination to the responses to individual questions but instead look also for patterns of responses among pairs of items. First, however, we will look at the individual questions:

1. As questions 9 and 10 show, participants are highly committed to summer inservicing in general and this project in particular.

2. The biggest problem had to do with the expectations participants brought with them into the project (question 8). This same concern has come through in group conferences on EIES. Many had either no expectations or something quite different in mind. Greater perceived participant control over the direction of the project should overcome much of this problem. While it is ture that participants were asked to help with the planning and few took advantage of this offer, we should not assume that a different strategy for soliciting this information would not be more effective.

3. The mixed attitude of participants concerning the usefulness of EIES is somewhat evident in question 7. The majority of participants were not highly favorable of the system with 14% registering negative feelings. The additional comments elicited in Part II of the evaluation forms concerning EIES are more mixed than the responses to question 7 might imply. In addition, despite the important role that the planners of this project felt EIES would play in the project's overall success, no significant effect was found between the participants' rating on the effectiveness of EIES and their feelings towards any of the other issues related to these summer workshops. Thus, overall analyses show no significant effect for EIES relative to workshop approval.

4. The other questions, 1 through 6, show generally favorable responses.

5. Responses to most of the questions other than the one dealing with EIES correlated positively and significantly with overall approval of the summer inservicing. No overall differences were found either among the different types of teachers or amount of teaching experience as they related to approval of the summer workshops.

C. College by College Breakdown

Because of the low number of participants in general and at some of the colleges in particular, these results must be interpreted extremely

cautiously. Some differences do appear to exist in how participants in the various groups as a whole answered the evaluation form questions. This section discusses some of these overall group differences.

1. One of the main differences among the groups (besides being at different colleges) was size of the group. Size was found to be a significant variable both in terms of participants' feelings that the presentation was appropriate to their needs and in their overall feelings about the value of the workshops. In both cases, smaller groups were more likely to strongly agree with the above two statements. The larger groups still felt favorable towards the project but not quite to the same degree. This could be indicative of the group homogeneity issue mentioned in Section I.

2. Teachers in Group I tended to be the most favorable concerning the effectiveness of EIES. Six of the nine respondents strongly agreed with question 7. No other group had more than one third of its participants in the strongly agree category for this question.

3. No differences were found on any of the other questions among the different group participants. The lack of controls among these groups makes any of the findings in this section difficult to interpret.

D. Participants comments concerning EIES

Comments ranged from highly positive to highly negative. The negative ones fell generally into the following categories:

1. not enough training was supplied.
2. time and computer access too limited.
3. effectiveness will be lost if project ends 12/84.
4. face to face meetings more effective.

Positive comments included:

1. EIES shows value of micro-computers and electronic communication.
2. continued dialogue once school year begins.
3. helped in developing course materials.
4. EIES helps keep teachers updated in advances in science and science education.

Much of the criticism could be avoided with more in-depth training on how to use the system as well as more information concerning the full capabilities of the EIES network. Monitoring of users at the various levels of organization of this project could also have a postive effect on participant usage of EIES.

Table 2

Percentages of Responses to
Summer Workshop Evaluation Forms

Position _____
Years Teaching _____

I. Please indicate the extent to which you agree with the following statements. Thank you.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. The content of these workshops were relevant to my needs.	24%	68%	4%	4%
2. The presentation was appropriate to my level of knowledge.	38%	62%	0	0%
3. The program provided new information on the topic for me.	38%	58%	4%	0%
4. The materials used were effective.	40%	56%	4%	0%
5. The activities used were effective.	36%	60%	4%	0%
6. I can apply the material covered directly into my classroom this fall.	21%	71%	8%	0%
7. The EIES network is an effective tool in a project such as this one.	43%	43%	14%	0%
8. The content of this program was consistent with my expectations.	16%	52%	32%	0%
9. Summer inservicing is an effective tool for secondary science teachers.	68%	28%	4%	0%
10. Overall, this has been a valuable experience for me.	56%	44%	0%	0%

Follow-up, Inservicing, and Support

Following the fall inservice sessions, participants were once again asked to respond to a series of open ended questions related to their satisfaction with EIES and the project. (See follow-up Questionnaire, Figure 1.) In addition, questions were added to determine if, even at this early stage of the project, some positive influences had filtered down to the classroom level of the high school teachers.

Before discussing these results, several points need to be made. Most important, the method of data collection differed markedly at this time. Responses were obtained directly over the electronic communication system; this clearly biases the results in favor of those both likely to access EIES on a fairly regular basis and those relatively facile with its use. We proceeded in this manner precisely for that reason. In order to fairly judge the effectiveness of the electronic communication system, we wanted the opinions of those with sufficient experience to draw conclusions. Subsequent analyses are currently being performed on data obtained from relative non-users of EIES.

Responses were received from approximately one half of the summer participants (14). T-tests showed significant differences between those who responded to the follow-up questionnaire and those who did not ($p < .01$) on several measures (amount of time on EIES, number of messages read or sent, participation in conferences, among others).

Figure 1

Follow-Up Questionnaire

In order to help evaluate this pilot project as fully as possible, we need direct input from all participants. Please answer the following questions as specifically and honestly as possible. Your comments will very much impact on the shape of this and related projects in the future.

Send your responses over EIES as a direct message to me (snr - the internal evaluator of this project) and the your college facilitator. You have the option to respond anonymously. We prefer however (to permit some follow-up) that you "sign" your work. Confidentiality will be strictly maintained! Please respond by March 8 at the latest. Thank you in advance for your cooperation.

snr

College Group _____
Subject(s) Taught _____
Years Teaching Subject(s) _____
Years Teaching _____

I. Describe your experience to date with the EIES network. How often did you use the network? In what capacity (e.g. read conferences, send messages, etc.)?

II. What were the advantages and limitations of the EIES network (be as specific as possible)? How has use of the network impacted on your teaching practices? How did the training you received on the use of EIES affect its usefulness?

III. Describe the extent of your micro-computer experience prior to this project. How has being involved in this project changed this status?

IV. Describe instances where your involvement in this project has had direct impact on some activities in your classroom. Include topics covered in workshops, interactions with college facilitators, high school participants, etc. Please be as specific as possible.

V. What changes would you like to see (e.g. administrative, workshops, EIES training) in the continuation phase of the project?

VI. Additional comments?

Table 3 shows the demographic information for the follow-up group. Of interest, no responses were received from college IV. This cannot be interpreted to mean that the three participants were unhappy with the project. All expressed satisfaction with the workshops presented. Rather this is indicative of dissatisfaction with the EIES system. Throughout the project, participants often distinguished between the project (in generally favorable terms) and EIES (much more mixed reviews).

Even more so than with the summer data, the low number of respondents limits the conclusions one can draw. Some patterns did, however, appear. A significant difference was found between group membership and perceived advantages of the EIES system ($\chi^2 = 8.1$, d.f. = 2, $p < .10$). The group most favorable was significantly more active than any of the others both in terms of messages sent and conferences read, as well as total number of interactions. Not surprisingly, the college facilitators of that group were also the most active. One conclusion readily drawn from this project is that specific training in the moderation of electronic conferences is essential for all facilitators.

The number of years teaching of the participants also affected their feelings concerning advantages in using the EIES system ($r = -.49$, d.f. = 12, $p < .10$). Thus, the less experience one had, the more favorable the rating of electronic communication in this project.

Table 3

Demographic Summary of Follow-up Population

a.

Position	Physics Teacher	Chemistry Teacher	ROW Total
College			
I	3	4	7
II	1	3	4
III	1	1	2
Column Total	5	8	

b.

Experience	Low	Medium	High	ROW Total
College				
I	4	2	0	6
II	1	1	2	4
III	0	1	1	2
Column total	5	4	3	

c.

Experience	Low	Medium	High+	ROW Total
Position				
Physics	3	1	1	5
Chemistry	1	3	2	6
Column Total	4	4	3	

Consistent with the above findings, Group I teachers were more likely to conclude that EIES impacted favorable on their classroom practices (χ^2 =7.7, d.f. = 4, $p < .10$). These teachers were even more likely to find the overall project impacting on their classrooms (χ^2 = 9.8, d.f. = 4, $p < .05$). Group I teachers however were somewhat more comfortable with micro-computers before the start of this project (χ^2 = 4.4, d.f. = 2, $p < .10$).

One of the most often stated criticism of the project had to do with the sufficiency of the training of EIES received by participants. As in the summer, this problem continued to exist among all groups. Of some surprise, prior experience with micro-computers did not affect one's rating of the effectiveness of EIES training.

The project has shown several positive effects in areas related to the professional development of the participants. A significant increase in knowledge of micro-computers was reported by the respondents (t = 4.42, d.f. = 13, $p < .01$). In addition, all 14 specifically noted their pleasur with the opportunity to interact will colleagues from other schools bot' in person at the college workshops and over EIES. Most also commended the college facilitators for their inservice presentations as well as their availability as additional sources to obtain information and answers to subject matter questions. High school colleagues were also cited as additional sources for these purposes.

The most common criticism of the project (other than but related to the EIES training) was the lack of use of the system by many participants. Several steps have been taken to ease that problem. Workshops sessions have been opened to all participants rather than limited to college group members. All participants are now members of all conferences with additional provisions made for membership of individuals already on the EIES system but not in this project.

Several steps have been taken to ease that problem. Workshops sessions have been opened to all participants rather than limited to college group members. All participants are now members of all conferences with additional provisions made for membership of individuals already on the EIES system but not in this project.

III. PRELIMINARY FINDINGS

Based upon the objectives of the study the following preliminary findings are reported using the data from the summer inservice evaluations, the six-month follow-up questionnaire, and the monitoring of the electronic communications system:

1. The project participants over time have used the electronic communications system to discuss instructional and classroom issues. The initial mode of electronic communications used was "private messages" through the mail feature. Teachers did not begin to conference with multiple participants until approximately 30 to 45 days of hands-on experience with the system and until some face-to-face meeting with the other potential conference participants had occurred.

2. The participants have used the electronic communications system to: 1) share information about curriculum and tests; 2) solve instructional problems; 3) initiate joint activities across school districts; e.g., experiments and field trips; 4) evaluate the use of technology in the classroom, textbooks and software materials, and the inservicing; 5) instruct each other about how to use equipment, set-up experiments, develop tests, teach the slow and gifted learner; 6) identify inservicing needs, content, and processes; and, 7) tell "war" stories about the classroom and the administration.

3. The participants, in general, have reacted favorably to the summer inservicing -- its content, presentation, value and effectiveness. With regard to the use of the electronic communications system some 14% disagreed with its effectiveness.

4. Of those participants who continued to use the electronic communications system and to participate in the inservicing a positive impact upon their classroom instruction was reported. They also responded positively to the opportunity to interact with the college and high school faculty and indicated professional growth in content areas and their knowledge of micro-computers.

Regarding the implementation process some of the following has been observed:

1. Insufficient pre-servicing on the use of the electronic communications systems was a barrier to its use by some participants and college faculty facilitators.

2. The more active the college faculty facilitators were in using the electronic network the more active were the participants. The most active facilitators appear to have overcome a less than homogeneous group of subject area teachers, and fostered discussions across physics and chemistry teachers.

3. The less experienced teacher the more willingness to participate on the electronic communications system.

Selected References

Berman, P. and McLaughlin, M. Federal Programs Supporting Educational Change, VOL. VII, Factors Affecting Implementation and Continuation. Santa Monica, California: Rand Corp., 1977.

Fullan, M. The Meaning of Educational Change. New York: Teachers College Press, Columbia University, 1982.

Goodlad, J. The Dynamics of Educational Change. New York: McGraw-Hill, 1975.

Harris, B. Improving Staff Performing Through Inservice Education. Boston: Allyn & Bacon, 1980.

Joyce B. & Showers B. Power in Staff Development Through Research and Training. Alexandria, Virginia: ASCD, 1983.

Miles, M.B. Change Process in the Public Schools. Eugene, Oregon: University of Oregon, 1965.

Moore, D. & Hyde, a. Rethinking Staff Development: A Handbook for Analyzing Your Program and Its Costs. Chicago: Design for Change, 1978.

Sarason, S. The Culture of the School and the Problem of Change. Boston: Allyn & Bacon, 1971.

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